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(54) Belt production

(57) A moulding machine for forming a belt of elastomeric material having side-by-side, spaced reinforcements extending laterally across the belt is disclosed. The machine comprises upper (19) and lower mould members (20) which, when closed together, define between them an elongate mould having a cross-sectional shape which is the required final cross-sectional shape of the belt. An overflow chamber (25) is provided extending along at least one edge of the mould chamber, as the mould members close together, so that, during moulding, the elastomeric material flows laterally generally parallel to the reinforcements into the chamber or chambers.

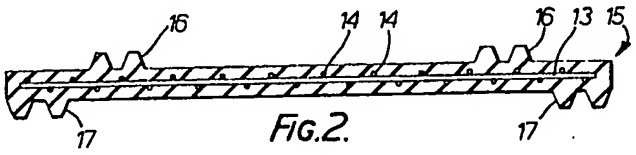

FIG.2.

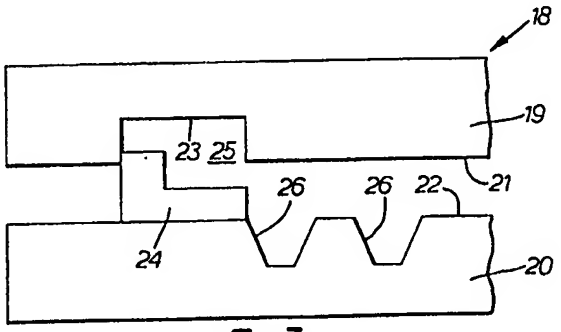

FIG.3.

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The drawing(s) originally filed was (were) informal and the print here reproduced is taken from a later filed formal copy.
The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1982.

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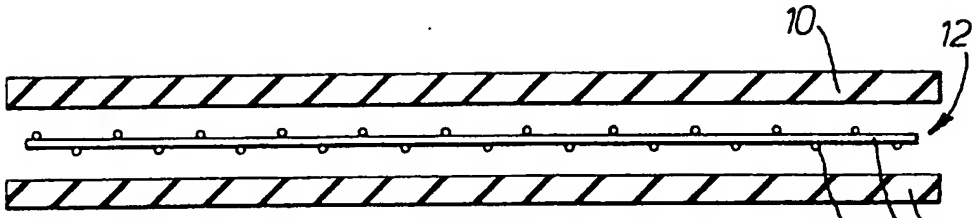

FIG.1.

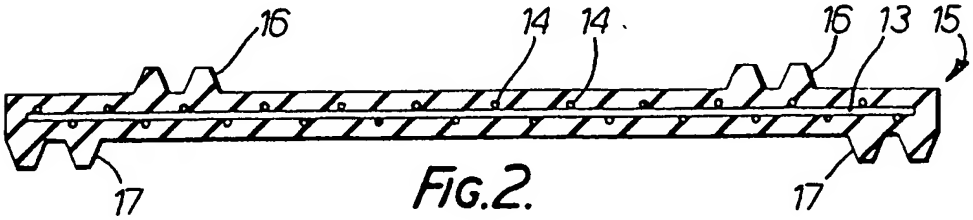

FIG.2.

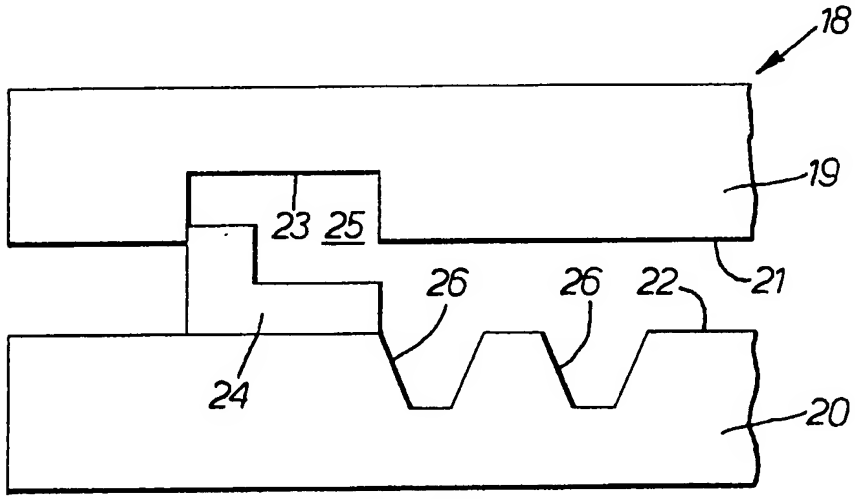

FIG.3.

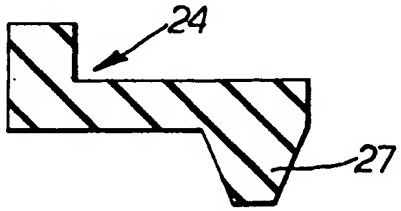

FIG.4.

SPECIFICATION

Belt production

The invention relates to the production of belts of elastomeric material having side-by-side but spaced reinforcements extending laterally across the belt.

The reinforcements provide such belts with lateral strength. This is important in, for example, belts which are conveyor belts because they allow such conveyor belts to trough under load. It has been found, however, that positioning of such reinforcements is critical; they must be held as close as possible to a position in which each reinforcement is normal to the length of the belt. A departure from this position by only a few degrees can have a significant adverse effect on the strength of the belt.

Such belts have previously been produced by vulcanizing and calendering elastomeric materials and transverse reinforcements in a heated mould. The elastomeric material is melted and flows around the lateral reinforcements to hold the reinforcements firmly in the belt. It has been found that this flow of molten elastomeric material can cause deviation of the reinforcements from a position normal to the length of the belt, thus affecting adversely the strength of the finished belt. According to a first aspect of the invention, there is provided a moulding machine for forming a belt of elastomeric material having side-by-side but spaced reinforcements extending laterally across the belt, the machine comprising upper and lower mould members which, when closed together, define between them an elongate mould having a cross-sectional shape which is the required final cross-sectional shape of the belt, and an overflow chamber extending along at least one edge of the mould chamber, as the mould members close together, so that, during moulding, the elastomeric material flows laterally generally parallel to the reinforcements into the chamber or chambers.

There may be provided an overflow chamber along one side edge only of the mould or along both side edges.

The or each overflow chamber may be formed in two parts, one part being formed in the upper mould member and the other part being formed in the lower mould member.

In the case where the lower mould member includes one or more depressions extending longitudinally along the or each side edge of the lower mould member, the overflow chamber part of the lower mould member may be formed by said one or more depressions.

The or each chamber may be open to the exterior of the mould, to allow the escape of gases, until the mould members are closed together.

According to a second aspect of the invention, there is provided a method of forming a belt of elastomeric material having side-by-side but spaced reinforcements extending laterally across the belt, the method comprising placing layers of elastomeric material and reinforcements in a required relative orientation in a mould, closing the mould to heat the elastomeric material, and causing the elastomeric material to flow only laterally, generally parallel to the reinforcements to prevent misalignment of the reinforcements by such flow and to mould the belt.

The invention also includes within its scope a belt, particularly a conveyor belt, when made with the machine of the first aspect of the invention or when made by the method of the second aspect of the invention.

The following is a more detailed description of some embodiments of the invention, by way of example, reference being made to the accompanying drawings in which:

Figure 1 shows two layers of elastomeric material and a layer of lateral reinforcements to be brought together in a mould to form a conveyor belt;

Figure 2 shows the moulded conveyor belt;

Figure 3 shows a moulding machine for moulding the belt of Figure 2; and

Figure 4 shows an alternative embodiment of an L-shaped part of the moulding machine of Figure 3.

Referring first to Figure 1, a conveyor belt is formed from upper and lower layers 10,11 of elastomeric material sandwiching between them a woven layer 12 having a weft of brass coated steel cords 13 and a warp of polymer strands 14 which serve to locate the weft cords in parallel side-by-side but spaced relationship.

Referring next to Figure 2, the layers 10,11,12 are moulded together in a heated mould (described below) to form an elongate conveyor belt 15 in which the steel cords 13 serve as lateral reinforcements to allow the belt 15 to trough under load. The belt has a pair of spaced elongate cable receiving grooves 16 on its upper surface and a pair of elongate cable receiving grooves 17 on its lower surface. The grooves 16 on the upper surface are spaced inwardly of the edges of the belt while the grooves 17 on the lower surface are at the edges of the belt.

It will be appreciated that this construction of conveyor belt 15 is given by way of example only. The belt may be formed from elastomeric material and reinforcements in any convenient way in any number of layers. The lateral reinforcements need not be provided in a woven layer but could be provided in any convenient way.

Referring next to Figure 3, the moulding machine 18 comprises an upper mould member 19 and a lower mould member 20. Only one side of the mould is shown but it will be appreciated that the other side is symmetrically arranged.

The upper mould member 18 has a planar mould defining surface 21 formed with depressions (not shown) forming the upper pair of cable receiving grooves 16. The lower mould member 20 also has a planar surface 22 provided with depressions 16 for forming the lower cable receiving grooves 17. The upper and lower mould members 19,20 are arranged so that when they are closed they form a mould having a cross-sectional shape which is the

required cross-sectional shape of the finished conveyor belt.

The upper mould member 19 is provided with a longitudinally extending channel 23 adjacent each lateral edge of the mould defining surface. The lower mould member 20 carries, along the edge of the mould surface, an L-shaped part 24 whose width is the same as the width of the channel 23 and which is aligned therewith. The depth of the horizontal limb of the L is the same as the final depth of the lower elastomeric layer 11.

In use, the two elastomeric layers and the woven layer 10,11,12 are placed on the lower mould member 20. The upper mould member 19 is then brought down and the elastomeric materials heated. At this stage, the vertical limb of the L-shaped part 24 does not enter the channel 23 and so gases can escape out of the mould. As downward movement of the upper mould member continues, the elastomeric material is heated to a point at which it flows. The channel is then closed by the vertical limb of the L-shaped part 24. The channel 23 and the depression 26 in the lower mould member 20 form a chamber 25 into which this flow takes place. Since the chamber is arranged along the edges of the mould, the flow of elastomeric material will be laterally across the mould and there will be substantially no flow in a direction along the length of the mould.

This means that this flow does not cause any movement of the steel cords 13 from their arrangement normal to the length of the finished belt. This ensures that the lateral strength of the belt is maximised.

Referrring next to Figure 4, it has been found that in certain circumstances there may be insufficient elastomeric material to fill the two depressions 26 forming the cable receiving grooves 17 on the lower surface of the belt. In this case, the L-shaped part 24 may be formed of elastomeric material as shown in Figure 4 with an end piece 27 which fits into the outermost of the depressions 26. In this way one part of each groove 17 on the lower surface is pre-formed and only the other half is formed by the moulding step, thus reducing the amount of elastomeric material from the layers required to form the grooves.

This moulding machine and the method of moulding described above obviate misalignment of the reinforcements out of their required position normal to the length of the belt. Thus there is a much reduced possibility of the strength of the belt being lowered by such misalignment.

CLAIMS

1. A moulding machine for forming a belt of elastomeric material having side-by-side but spaced reinforcements extending laterally across the belt, the machine comprising upper and lower mould members which, when closed together, define between them an elongate mould having a cross-sectional shape which is the required final cross-sectional shape of the belt, and an overflow chamber extending along at least one edge of the mould chamber, so that, as the mould members close together during moulding, the elastomeric material flows laterally generally parallel to the reinforcements into the chamber or chambers.

2. A machine according to claim 1, wherein an overflow chamber is provided along one side edge only of the mould.

3. A machine according to claim 1, wherein an overflow chamber is provided along both side edges.

4. A machine according to any one of claims 1 to 3, wherein the or each overflow chamber is formed in two parts, one part being formed in the upper mould member and the other part being formed in the lower mould member.

5. A machine according to claim 4, wherein the lower mould member includes one or more depressions extending longitudinally along the lower mould member parallel to the or each side edge of the lower mould member, the overflow chamber part of the lower mould member being formed by said one or more depressions.

6. A machine according to any one of claims 1 to 5, wherein the or each overflow chamber is open to the exterior of the mould until the mould members are closed together, to allow the escape of gases.

7. A machine according to any one of claims 1 to 6, wherein the lower mould member includes a side member which extends along an edge thereof and which is of L-shaped cross-section, the horizontal limb of the member extending towards and defining a side edge of the mould, the upper mould member including a channel which extends along an edge thereof, which is of the same width as the side member and which is in register therewith, so that, as the mould closes, the channel and the side member form the overflow chamber as the vertical limb of the side member enters the channel, the chamber closing as the horizontal limb of the side members enters the channel, as the mould is closed.

8. A machine according to claim 7, wherein the side member is formed of the elastomeric material of the belt and is separate from the lower mould member so that said side member is incorporated into the belt on moulding.

9. A machine according to claim 8 when dependant on claim 5, wherein the horizontal limb of the side member is extended and includes a portion extending into the or one of said one or more depressions in the lower mould member.

10. A moulding machine for forming a belt of elastomeric material substantially as hereinbefore described with refernce to the accompanying drawings.

11. A method of forming a belt of elastomeric material having side-by-side but spaced reinforcements extending laterally across the belt, the method comprising placing in a mould, layers of elastomeric material and reinforcements in a required relative configuration, closing the mould to heat the elastomeric material, and causing the heated elastomeric material to flow only laterally, generally parallel to the reinforcements, to prevent

misalignment of the reinforcements by such flow and to mould the belt.

12. A method according to claim 11 and including providing, until the mould is closed, an overflow cavity along one edge of the mould for receiving heated elastomeric material to cause the heated elastomeric material to flow laterally across the mould.

13. A method according to claim 12, wherein overflow cavities are provided along both sides of the mould.

14. A method of forming a belt, substantially as hereinbefore described with reference to the accompanying drawings.

15. A conveyor belt when made with the machine of any one of claims 1 to 10 or when made by the method of any one of claims 11 to 14.

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